Defense Waste Processing Facility

The largest radioactive waste glassification plant in the world, the Defense Waste Processing Facility (DWPF) converts the liquid radioactive waste currently stored in waste tanks at the Savannah River Site (SRS) into a solid glass form suitable for long-term storage and disposal.

Scientists have long considered this glassification process, called "vitrification," as the preferred option for treating radioactive liquids. By immobilizing the radioactivity in glass, the DWPF reduces the risks associated with the continued storage of radioactive wastes at SRS. About 36 million gallons of radioactive wastes are now stored in 49 underground carbon-steel tanks at SRS. This waste has about 421 million curies of radioactivity, and requires permanent isolation from the environment. The DWPF plays a major role in treating this waste to yield a durable stable solid glass waste form suitable for disposal in a federal radioactive waste repository.

Construction of the plant began in late 1983, and DWPF began radioactive operations in March 1996.

Waste feed to DWPF

The radioactive waste in tank storage exists in two forms, a sludge form and a salt form. The sludge, or insoluble waste, makes up about8 percent of the waste volume, but contains about 46 percent of the curies. The salt form, which readily dissolves in water, makes up about 92 percent of the volume and contains about 54 percent of the curies. DWPF is designed to treat both forms of waste; however, DWPF treatment of salt waste awaits the construction of a new facility, the Salt Waste Processing Facility, which is projected to become operational in about 2011.

Defense Waste Processing Facility operations

DWPF is presently vitrifying the sludge form of the radioactive waste currently in tank storage. In this process, a sand-like borosilicate glass (called "frit") is mixed with the waste and sent to the plant's 65-ton steel and ceramic melter. In the melter, electricity is used to heat the waste/frit mixture to nearly 2,100 degrees Fahrenheit until molten. This molten glass-waste mixture is poured, in a pencil-thin stream, into stainless steel canisters to cool and harden.

Each canister is 10 feet tall and 2 feet in diameter; it takes a little over a day to fill one canister. A filled DWPF canister weighs about 5,000 pounds.

After a canister is filled, the exterior is blasted with a frit-water mixture to remove contamination. A stainless steel plug is fitted into the neck of each filled canister and the canister is welded shut using a current of 250,000 amps applied for 1.5 seconds, while 80,000 pounds of force simultaneously rams the plug into the neck of the canister. The resulting weld is as strong as the 3/8-inch-thick stainless steel canister itself.

Moving canisters to temporary storage

A specially designed “Shielded Canister Transporter” moves each sealed canister, one at a time, from DWPF to the temporary storage building adjacent to the facility. This transporter, which is more than 18 feet tall and 25 feet long and weighs 235,000 pounds, is a two-wheel drive vehicle powered by redundant diesel engines. It has a center module with a shielding cask, floor plug cavity and associated canister lifting equipment. At DWPF, the transporter draws canisters up into the shielded cask for the short trip to the storage building.

At the storage building, canisters are lowered by the transporter into an underground reinforced concrete vault containing 2,286 individual canister supports. This seismically qualified storage vault, 204 feet wide by 209 feet long, can hold about 8-10 years of canisters at current DWPF production rate. More storage buildings can be built according to the need for interim storage space. Glass Waste Storage Building #2 has been constructed and is nearly ready for operations.

The canisters will be safely stored at SRS until a federal repository is established.

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